

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A computer implemented method, in a data processing system, for detecting fraud, the computer implemented method comprising:

a plurality of steps performed by a processor in the data processing system, the plurality of steps comprising:

receiving a set of historical data stored in a customer behavior database;

identifying a plurality of control points in the set of historical data using a data analysis module, further comprising:

identifying a plurality of outliers in a distribution of the set of historical data; and

validating the plurality of outliers to distinguish between a first set of outliers and a second set of outliers, wherein the first set of outliers are classified as valid outliers and the second set of outliers are classified as invalid outliers, and wherein the first set of outliers are identified as the plurality of control points;

building at least one data model based on the plurality of control points, further comprising:

generating a fence that passes through the plurality of control points to define a boundary between data points, wherein the fence comprises line segments connecting the plurality of control points to form a continuous line for the boundary, and wherein data points ~~within~~ inside the boundary of the fence represent acceptable behavior and data points outside the boundary of the fence represent fraudulent behavior;

receiving a set of updated data, wherein the set of updated data includes a plurality of current data stored in the customer behavior database;

identifying one or more new control points based on the set of updated data using the data analysis module, further comprising:

identifying an additional plurality of outliers in a distribution of the set of updated data; and

validating the additional plurality of outliers to distinguish between a third set of outliers and a fourth set of outliers, wherein the third set of outliers are classified as valid outliers and the fourth set of outliers are classified as invalid outliers, and wherein the third set of outliers are identified as the one or more new control points;

adjusting the at least one data model to form an adjusted fence data model, within the at least one data model, based on the one or more new control points, wherein the at least one data model is refined for a plurality of iterations, further comprising:

generating the adjusted fence that passes through the plurality of control points and the one or more new control points to define a new boundary between data points, wherein the adjusted fence comprises line segments connecting the plurality of control points and the one or more new control points to form a new continuous line for the new boundary, and wherein data points inside the new boundary of the adjusted fence represent acceptable behavior and data points outside the new boundary of the adjusted fence represent fraudulent behavior; and
verifying a transaction based on the adjusted fence data model.

2. (Currently Amended) The computer implemented method of claim 1, wherein the set of historical data includes at least one of demographic data, psychographic data, transactional data, and environmental data.

3. (Currently Amended) The computer implemented method of claim 1, wherein the plurality of outliers in the distribution of the set of historical data are identified by analyzing the historical data using statistical modeling, outlier analysis, and data mining algorithms.

4-6. (Canceled)

7. (Currently Amended) The computer implemented method of claim 1, wherein the set of updated data includes at least one of demographic data, psychographic data, transactional data, and environmental data.

8. (Currently Amended) The computer implemented method of claim 1, wherein generating the adjusted fence ~~adjusting the at least one data model~~ includes:

adding the one or more new control points to the adjusted fence ~~at least one data model~~;
and

~~generating an adjusted fence that passes through the plurality of control points and the one or more new control points to define a boundary between data points, and wherein data points within the adjusted fence represent acceptable behavior and data points outside the adjusted fence represent fraudulent behavior.~~

9. (Currently Amended) The computer implemented method of claim 1, wherein generating the adjusted fence ~~adjusting the at least one data model~~ includes:

changing one or more of the plurality of control points to the one or more new control points in the adjusted fence ~~at least one data model~~; and

~~generating an adjusted fence that passes through the plurality of control points to define a boundary between data points, and wherein data points within the adjusted fence represent acceptable behavior and data points outside the adjusted fence represent fraudulent behavior.~~

10. (Currently Amended) The computer implemented method of claim 1, further comprising:

determining whether the adjusted fence ~~data model~~, within the at least one data model, reached a steady state;

converting the adjusted fence ~~data model~~ to a static model in response to a determination that the adjusted fence ~~data model~~ reached the steady state; and

refining the at least one data model for an iteration of the plurality of iterations in response to a determination that the adjusted fence ~~data model~~ has not reached the steady state.

11. (Currently Amended) The computer implemented method of claim 10, wherein determining whether the adjusted fence ~~data model~~ reached a steady state includes:

determining a difference between the adjusted fence ~~data model~~ and a previous data model, within the at least one data model, to form a delta value; and

determining whether the delta value is less than a threshold.

12. (Currently Amended) The computer implemented method of claim 11, wherein the threshold is two standard deviations from a mean within a normal distribution of ~~[[the]]~~ data.

13. (Currently Amended) A computer program product, in a computer readable medium, for detecting fraud, the computer program product comprising:

a plurality of instructions stored in the computer readable medium, wherein the plurality of instructions are adapted to cause a processor in a computer to perform steps comprising:

~~instructions for~~ receiving a set of historical data stored in a customer behavior database;

~~instructions for~~ identifying a plurality of control points in the set of historical data using a data analysis module, further comprising:

~~instructions for~~ identifying a plurality of outliers in a distribution of the set of historical data; and

~~instructions for~~ validating the plurality of outliers to distinguish between a first set of outliers and a second set of outliers, wherein the first set of outliers are classified as valid outliers and the second set of outliers are classified as invalid outliers, and wherein the first set of outliers are identified as the plurality of control points;

instructions for building at least one data model based on the plurality of control points, further comprising:

~~instructions for~~ generating a fence that passes through the plurality of control points to define a boundary between data points, wherein the fence comprises line segments connecting the plurality of control points to form a line for the boundary, and wherein data points within inside the boundary of the fence represent acceptable behavior and data points outside the boundary of the fence represent fraudulent behavior;

~~instructions for~~ receiving a set of updated data, wherein the set of updated data includes a plurality of current data stored in the customer behavior database;

~~instructions for~~ identifying one or more new control points based on the set of updated data using the data analysis module, further comprising:

~~instructions for~~ identifying an additional plurality of outliers in a distribution of the set of updated data; and

~~instructions for~~ validating the additional plurality of outliers to distinguish between a third set of outliers and a fourth set of outliers, wherein the third set of outliers

are classified as valid outliers and the fourth set of outliers are classified as invalid outliers, and wherein the third set of outliers are identified as the one or more new control points;

~~instructions for adjusting the at least one data model to form an adjusted fence data model~~, within the at least one data model, based on the one or more new control points, wherein the at least one data model is refined for a plurality of iterations, further comprising:

generating the adjusted fence that passes through the plurality of control points and the one or more new control points to define a new boundary between data points, wherein the adjusted fence comprises line segments connecting the plurality of control points and the one or more new control points to form a new continuous line for the new boundary, and wherein data points inside the new boundary of the adjusted fence represent acceptable behavior and data points outside the new boundary of the adjusted fence represent fraudulent behavior; and

~~instructions for verifying a transaction based on the adjusted fence data model.~~

14. (Currently Amended) The computer program product of claim 13, wherein the set of historical data includes at least one of demographic data, psychographic data, transactional data, and environmental data.

15. (Currently Amended) The computer program product of claim 13, wherein the plurality of outliers in the distribution of the set of historical data are identified by analyzing the set of historical data using statistical modeling, outlier analysis, and data mining algorithms.

16-18. (Canceled)

19. (Currently Amended) The computer program product of claim 13, wherein the set of updated data includes at least one of demographic data, psychographic data, transactional data, and environmental data.

20. (Currently Amended) The computer program product of claim 13, wherein generating the adjusted fence ~~the instructions for adjusting the at least one data model~~ include:

~~instructions for adding the one or more new control points to the adjusted fence at least one data model; and~~

~~instructions for generating an adjusted fence that passes through the plurality of control points and the one or more new control points to define a boundary between data points, and wherein data points within the adjusted fence represent acceptable behavior and data points outside the adjusted fence represent fraudulent behavior.~~

21. (Currently Amended) The computer program product of claim 13, wherein generating the adjusted fence ~~the instructions for adjusting the at least one data model~~ include:

~~instructions for changing one or more of the plurality of control points to the one or more new control points in the adjusted fence at least one data model; and~~

~~instructions for generating an adjusted fence that passes through the plurality of control points to define a boundary between data points, and wherein data points within the adjusted fence represent acceptable behavior and data points outside the adjusted fence represent fraudulent behavior.~~

22. (Currently Amended) The computer program product of claim 13, further comprising:
~~instructions for determining whether the adjusted fence data model, within the at least one data model, reached a steady state;~~

~~instructions for converting the adjusted fence data model to a static model in response to a determination that the adjusted fence data model reached the steady state; and~~

~~instructions for refining the at least one data model for an iteration of the plurality of iterations in response to a determination that the adjusted fence data model has not reached the steady state.~~

23. (Currently Amended) The computer program product of claim 22, wherein ~~the instructions for~~ determining whether the adjusted fence data model reached a steady state ~~include~~ includes:

~~instructions for~~ determining a difference between the adjusted fence data model and a previous data model, within the at least one data model, to form a delta value; and

~~instructions for~~ determining whether the delta value is less than a threshold.

24. (Currently Amended) The computer program product of claim 23, wherein the threshold is two standard deviations from a mean within a normal distribution of ~~[[the]]~~ data.

25. (Currently Amended) An apparatus for detecting fraud, the apparatus comprising:

a processor, and instructions stored in a memory, wherein the instructions are adapted to cause the processor to perform a plurality of steps comprising:

~~means for~~ receiving a set of historical data stored in a customer behavior database;

~~means for~~ identifying a plurality of control points in the set of historical data using a data analysis module, further comprising:

~~means for~~ identifying a plurality of outliers in a distribution of the set of historical data; and

~~means for~~ validating the plurality of outliers to distinguish between a first set of outliers and a second set of outliers, wherein the first set of outliers are classified as valid outliers and the second set of outliers are classified as invalid outliers, and wherein the first set of outliers are identified as the plurality of control points;

~~means for~~ building at least one data model based on the plurality of control points, further comprising:

~~means for~~ generating a fence that passes through the plurality of control points to define a boundary between data points, wherein the fence comprises line segments connecting the plurality of control points to form a continuous line for the boundary, and wherein data points within inside the boundary of the fence represent acceptable behavior and data points outside the boundary of the fence represent fraudulent behavior;

~~means for~~ receiving a set of updated data, wherein the set of updated data includes a plurality of current data stored in the customer behavior database;

~~means for~~ identifying one or more new control points based on the set of updated data using the data analysis module, further comprising:

~~means for~~ identifying an additional plurality of outliers in a distribution of the set of updated data; and

~~means for~~ validating the additional plurality of outliers to distinguish between a third set of outliers and a fourth set of outliers, wherein the third set of outliers are classified as valid outliers and the fourth set of outliers are classified as invalid outliers, and wherein the third set of outliers are identified as the one or more new control points;

~~means for~~ adjusting the at least one data model to form an adjusted fence data model, within the at least one data model, based on the one or more new control points, wherein the at least one data model is refined for a plurality of iterations, further comprising:

generating the adjusted fence that passes through the plurality of control points and the one or more new control points to define a new boundary between data points, wherein the adjusted fence comprises line segments connecting the plurality of control points and the one or more new control points to form a new continuous line for the new boundary, and wherein data points inside the new boundary of the adjusted fence represent acceptable behavior and data points outside the new boundary of the adjusted fence represent fraudulent behavior; and

~~means for~~ verifying a transaction based on the adjusted fence data model.